INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

OPTIMIZATION IN DESIGN AND FABRICATION OF MATERIAL HANDLING SYSTEM FOR WELDING RODS

SACHIN NAIK[1], PROF. DR. A. R. BAPAT[2]

1. M. Tech Scholar, Abha Gaikwad Patil College of Engg., Nagpur.
2. Dean, Department of Mechanical Engineering, Tulsiram Gaikwad Patil college of Engg, Nagpur.

Accepted Date: 14/08/2015; Published Date: 01/09/2015

Abstract: - Automation in production is need of today's industry. Automation enhances the production, increases accuracy, improves quality and reduces the chances of accidents. Keeping this in mind I visited 'Weld Well Industries Pvt. Ltd', the manufacturers of welding rods. The cut rods are 300mm in length and 2.5mm, 3.15mm and 4mm in diameter. Presently the wire rods are being cut by the cutting machine and are collected in a pot. Then the worker picks those rods and arranges them in a rack. The company needs a system which will enable them to stack the rods directly in the rack without any human intervention. The main objective of this project is to design a system which will solve the above problem as discussed.

Keywords: Stacking of rods, welding electrode process, automation for collection of bare electrodes

Corresponding Author: MR. SACHIN NAIK

Access Online On:

www.ijpret.com

How to Cite This Article:

Sachin Naik, IJPRET, 2015; Volume 4 (1): 23-32

PAPER-QR CODE

INTRODUCTION

Welding electrodes are used in welding various metals in the fabrication of equipment for chemical & Allied industries, construction of steel structures such as bridges, factory sheds, in the manufacture of ships, Vehicles and engineering equipment. Mild steel is welded by electrodes to a maximum among all the metals & Alloys. Therefore M.S. Welding Electrode is the most widely used core wire. Besides this, special grade electrodes are being developed for specific applications.

Welding electrodes comprise basically of steel core wire and coating ingredients or flux mild steel core wires are used in majority of unalloyed steel electrodes. Besides mild steel, nickel, Nickel-copper, Nickel irons are also used in MIG & TIG welding.

Stainless steel wires are also used for welding in fertilizer, chemical & surgical instrument making industry. Coating ingredients are basically rutile, potassium silicate, sodium silicate and minerals like quartz, calcite and mica. Ferro-alloys are also used in the formulations of fluxes. [1]

2.0 PROBLEM AREA

Weldwell Electrodes Pvt. Ltd was established in the year 1985, the company got reputation in the field of electrode making from last 30 years, and hence are one of the trustworthy manufacturers and suppliers of a gigantic compilation of Welding Electrodes & Mig Wire. Main product of the company consists of Mild Steel Electrodes, Low Hydrogen Electrodes and Creep Resistant Electrode that are manufactured as per the preset IS, AWS, LRS, DNV, BV, IRS, ABS, BIS and DIN standards.

To improve the product Quality Company frequently does third party inspection, R & D on the existing and for new components. They have marked their presence in the business, with huge impact and proved themselves as an example for their peers. In these years, they have gained immense trust and dependence of the customers and garnered an unmatched position in the business.

3.0 NEED OF COMPANY

The company is facing a problem of stacking of welding rods. They have to keep a worker engaged continuously for this work. Company wants to eliminate human intervention and needs a system to stack the rods in a rack for further work.

Speed of wire cutting is around 400 electrodes per minute and it is collected in a container. The worker collects these rods by hand and stacks in the trolley. The company wants the cut electrodes to get stacked automatically in the container.

CAD and FEM tools are used to check the trolley and other parts design for safety and actual implementation work. Distance travelled by bare rods after getting cut is calculated by work energy principle. Accordingly the slot in the plastic pipe is provided.

The guides provided just below the slot ensure proper falling of the rods in the trolley. The compartments in the trolley are according to size of the rods ensure the horizontal position of the rod.

4.0 STEPS INVOLVED IN ELECTRODE MANUFACTURING

4.1 Step I: Wire Drawing

Wire drawing is a process employed to produce wire from rod by pulling the rod and wire through one or more dies in order to reduce the cross-sectional area until a final product of the desired cross-section is achieved.

"Rod" is a term used to denote hot-rolled, undrawn stock used in the wire drawing process. "Wire" is the term used to denote the product of drawing, i.e., rod which has been reduced in cross-sectional area.

A 5 mm diameter wire is drawn through the rollers by two step reduction process. In Each step 0.5mm dia. is reduced.

Figure 4.1: Wire Drawing Process

Figure 4.2: Dry Drawing Lubricant used by Weld well company

4.2 Step II: Wire Cutting

The wire drawn from the Step-I is then cut into the required lengths by cutting machine as is collected in the container as shown.

Figure 4.3: Cut wire collected in container

4.3 Step III: Flux Coat Preparation

A flux coating is a layer of a chemical which acts as a cleaning agent, a purifying agent or a flowing agent. The coating is used on electric welding rods and serves several functions. It protects the weld pool and solid metal from atmospheric contamination and helps in removing impurities from the weld pool. The impurities float on the surface of the pool and are easily removed after it cools down. These two functions contribute to the formation of a strong and durable welded joint.

Figure 4.4: Powder formed for flux coat preparation

4.4 Step IV: Flux Coating

When a flux-coated electrode is heated up, part of the flux burns and forms a gaseous shield which keeps the oxygen away from the weld. This prevents the formation of a poor weld which occurs when iron burns in oxygen. Another part of the flux melts and mixes with the weld pool, the impurities of which float and are easily removed when the weld joint cools down.

Flux coating on the electrodes ensures a weld with good mechanical properties, chemical composition and weld metal cleanliness

Figure 4.5: Flux coating by extrusion

4.5 Step V: Flux Drying (De-moisturizing)

Electrodes must be kept dry. Moisture destroys the desirable characteristics of the coating and may cause excessive spattering and lead to porosity and cracks in the formation of the welded area. Electrodes exposed to damp air for more than two or three hours should be dried by heating in a suitable oven for two hours at 500°F (260°C).

After they have dried, they should be stored in a moisture proof container. Bending the electrode can cause the coating to break loose from the core wire. Electrodes should not be used if the core wire is exposed.

Electrodes that have an "R" suffix in the AWS classification have a higher resistance to moisture.

Figure 4.6: Flux de-moisturizing in oven

4.6 Step VI: Finishing [1]

The flux at end of the welding rod is removed by brush and other end is chamfered by means of grinder. It is done so that one end must be properly gripped to the welding holder and proper arc formation at other end. Both these process are done at a time.

Figure 4.7: Finishing of electrodes

4.7 Step VII: Quality Checking & inspection

Weight of electrodes is measured and checked. Also core wire diameter, length and flux coating thickness, moisture is inspected. [1]

Figure 4.8: Inspection of electrode

5.0 SOLUTION TO PROBLEM

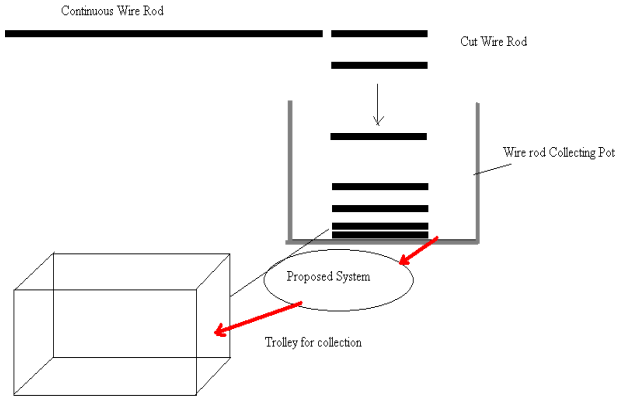

Figure 5.1: Conceptual model of system

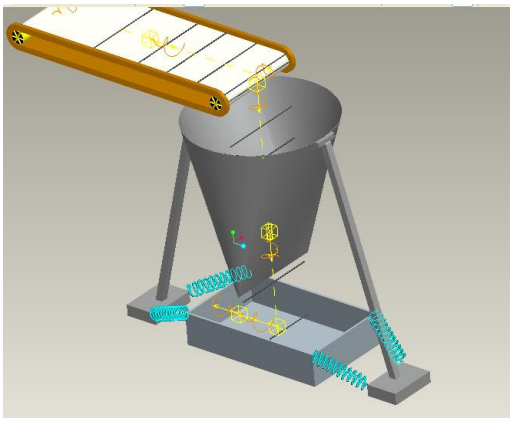

Figure 5.2: Electrode collecting hopper (Design I)

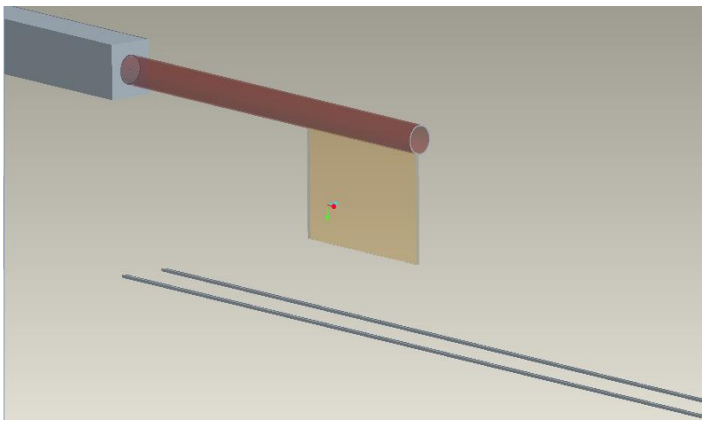

Figure 5.3: Electrode exit arrangement (Design II)

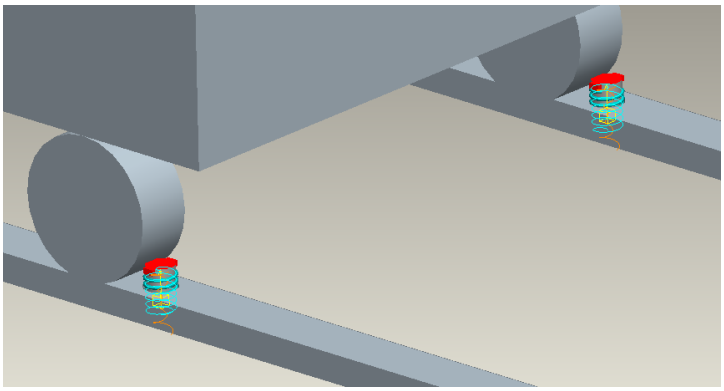

Figure 5.4: Spring stopper having weight sensor

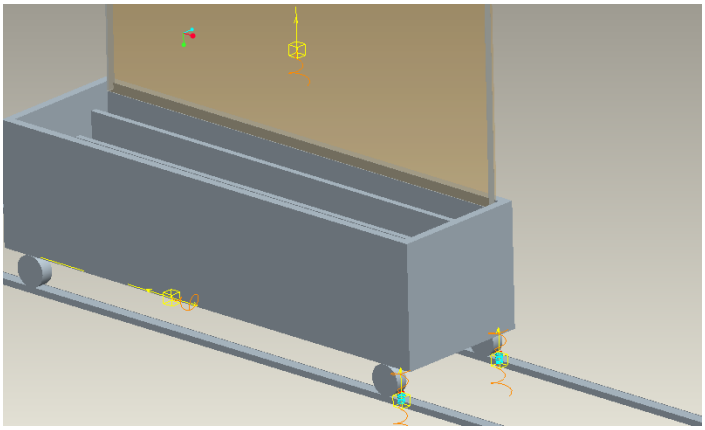

Figure 5.5: Total Arrangement

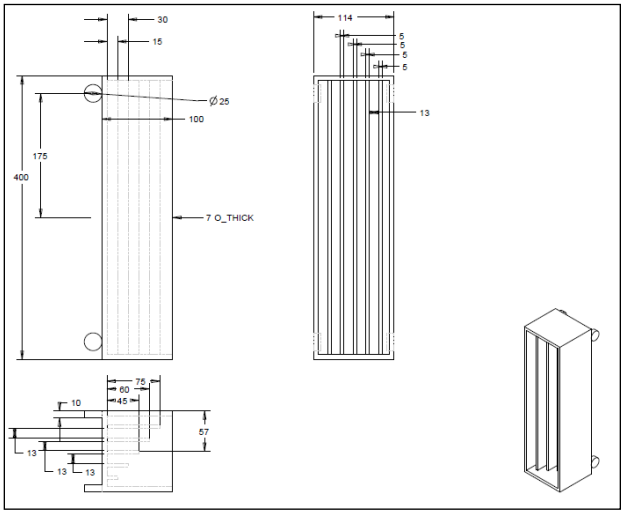

Figure 5.6: Drafting of the trolley prepared

6.0 CONCLUSION

After the cutting of wire, the bare rods are collected in container which is further stacked in a trolley manually. Two operators were engaged for the collection and stacking of wire rods in the trolley.

The time needed for collection and stacking of 100 bare rods was around 4.5 to 5 mins with existing system.

The proposed system eliminates the one of the operators. Also the time required for the collection of 100 bare rods is reduced to around 2.5 to 3 mins. Hence adopted by the company for the future work.

7.0 REFERENCE

1. Company website for details: http://www.weldwellelectrodes.com

2. Yrd. Doç. Dr. Oguzhan Yılmaz, “Electrode Materials and electrode selection”, Department of Mechanical Engineering, University of Gaziantep, Welding Technology, pp 1-30.

3. Harald Strolimeier and Gottlieb Pernkopf, Kapfenberg,, “Apparatus for Stacking and packing cylindrical or rod-shaped work pieces-patent.” United States Patent Office, 2012.

4. Bob Romig, “Stacking Lumber for Drying.”, The OHIO State University US. School Natural Resources, 2021 Coffey Road, Columbus, Ohio 43210.

5. Vincent m. Altamuro, “Materials Handling Systems”, Columbus McKinnon Corp

6. Nimmo Jr., Philip E. (Wayne, NJ) , Townsend, Richard A. (Rockaway, NJ), “Ribbon package and process for production thereof US 3735862 A”, Sun Chemical Corporation (New York, NY).

7. Haley, “Magnetic material feed control US 2962150 A”, United States Patent Office

8. Hoar, “Counting and packaging apparatus US 2632588 A”, United States Patent Office

9. Roland W. Wagner, William K. Switzer, “Apparatus for and method of accumulating and thereafter releasing, en masse, a pre-determined number of individual, elongated, cylindrical articles”, United States Patent Office